

## ENRICHMENT OF NUTRITIONAL QUALITY OF YOGHURT BY INCORPORATING SOYA PROTEIN ISOLATES AND WHEY PROTEIN CONCENTRATES

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### ABSTRACT

*Soy protein, an important component of soybeans, provides an abundant source of dietary protein. Among the plant proteins, soy protein is considered as a complete protein containing ample amounts of all the essential amino acids and several other micronutrients with a nutritional value which is alike to that protein present in animals which is of high biological value. In the current study, the replacement of SNF in Yoghurt found to have a slight effect on both acidity and pH. The acidity increased with increase in extent of replacement and there was a corresponding increase in pH. To study the effect of replacement on sensory characteristic of Yoghurt the control and treated samples was given to a panel of judges. The replacement had no significant effect on the color and appearance, flavor, body and texture as well as the overall acceptability of the product. The results clearly indicate that admixture of SPI and WPC can be effectively used to replace SNF in yoghurt to improve nutritional characteristics without affecting the quality parameters.*

**KEYWORDS:** *Soya Protein, Yoghurt, SPI & WPC*

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### INTRODUCTION

Soy protein, an important component of soybeans, provides an abundant source of dietary protein. Among the plant proteins, soy protein is considered as a complete protein containing ample amounts of all the essential amino acids and several other micronutrients with a nutritional value which is alike to that protein present in animals which is of high biological value. Soy protein is unique among the plant based proteins because it is associated with isoflavones; these are phytochemicals with a variety of biological properties that may potentially benefit human health. Gelation of whey protein is an important property being commonly employed in the food industry. Effective gelation of whey proteins is affected by many factors such as pH, heat and ionic calcium concentration. Conservation of whey solids in the form of whey protein concentrate (WPC) and their utilization in food formulation has a great potential to improve the quality attributes of various foodstuffs. WPC had a wide range of applications in the processing of foods such as bakery products, dairy products, frozen desserts, salad dressings, and sport supplements. Yoghurt is regarded as a cultured milk product of high moisture content and good quality of proteins. The product is accepted by the consumer because of its flavor and aroma mainly acetaldehyde, and texture. Incorporating soy protein isolate and whey protein concentrate mixture could improve its nutritional value and rheological characteristics.

## MATERIALS AND METHODS

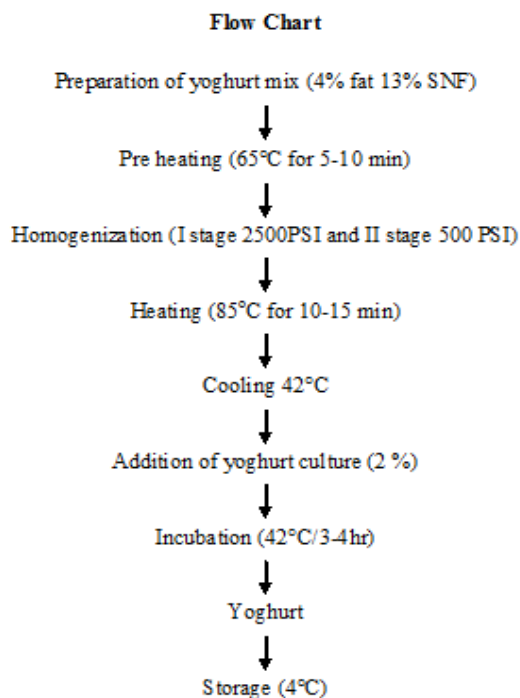
Soy joy brand devoted to toast soy flour, manufactured by Nilgiris was procured from the local market. Whole milk obtained from the Student Experimental Dairy Plant (SEDP) of the Dairy Science College, Bangalore and milk was standardized to the required fat and SNF. Amul brand cream was purchased from the market 'NANDINI' brand manufactured by Mother Dairy (A unit of K.M.F. Ltd.), was purchased from the local market. Good quality sugar was procured from the local market (FAB mall). Commercially available Sodium alginate as a stabilizer and Glycerol Mono stearate of Eagle brand as emulsifier was used. PROCON 3700 procured from Mahaan group are used during the study.

### Preparation of Set Yoghurt (Control)

The yoghurt was prepared according to the method of Kosikowaski (1977). Fresh toned milk was standardized to 4 % fat and 13 % SNF. The milk was preheated to 65°C for 5-10 min. The mix was then homogenized in two stages by maintaining the pressures of 2500 PSI in the first stage and 500 PSI in second stage. The sample was heated to 85°C for 10-15 min and cooled to 42 °C. Then culture was added at the 2.0 % level and incubated at 42 °C for 3-4 h for the setting of curd.

### Preparation of Set Yoghurt Incorporated with SPI-WPC (1:1) Mixture

Yoghurt mix containing 4% fat 13% SNF was prepared using cream, SMP and admixture of SPI-WPC. The admixture of SPI-WPC is prepared by mixing SPI and WPC in equal ratio (1:1) and is added depending on the level of replacement of MSNF (25% and 50%). The mix was preheated to 65°C for 5-10 min and homogenized in two stages by maintaining the pressures of 2500 PSI and 500 PSI. The sample was heated to 85°C for 10-15 min and cooled to 42°C. The culture was added at 2.0 % of the samples and incubated at 42°C for 3-4 h for the setting of curd.



**Figure 1**

### Starter Culture

The starter cultures of *Streptococcus thermophilus* and *Lactobacillus bulgaricus* were procured from the postgraduate Laboratory, Dairy microbiology Dept, KVAFSU, Bangalore. These two cultures were mixed in the ratio of 1:1 and the stock cultures were maintained in plain skim milk. The culture propagation was done by using sterilized skim milk in 10 ml test tube, being inoculated with a culture and allowed them for setting of temperature of 42°C for 3-4 hours in an incubator.

## RESULTS AND DISCUSSIONS

### Effect of Replacement of SNF with SPI-WPC Mixture on Acidity and pH of Yoghurt

The admixture of SPI and WPC (1:1 ratio) was used to replace SNF to different levels (25% and 50%) in yoghurt. Then the effect of replacement on acidity and pH of yoghurt was studied.

The acidity (% LA) of experimental samples was 0.710 and 0.719 as against 0.702 for control. The corresponding pH ranged from 4.81 to 4.75 for experimental samples and 4.84 for control. The results are depicted in table 1. The results indicate that the acidity increased slightly with the increase in the replacement of SNF with the SPI-WPC mixture and there was a corresponding decrease in the pH of yoghurt. However the values of both acidity and pH were within the prescribed standards. Classical ANOVA was applied for analyzing the data obtained. The results indicate that there is no significant effect of replacement with respect to acidity and pH of Yoghurt.

**Table 1: Effect of Substitution of SNF with SPI-WPC (1:1) Mixture on Acidity and pH of Yoghurt\***

Extent of Replacement	Acidity (%LA)	pH @ 25° C
control	0.702	4.84
25 %	0.710	4.81
50 %	0.719	4.75
	NS	NS

\* Average of 3 Trials

NS- Non Significant

### Effect of Replacement of SNF with SPI-WPC (1:1) Mixture on the Sensory Attributes of Yoghurt

The control as well as experimental samples was served to a panel of five judges for adjudging the quality of Yoghurt with respect to color and appearance, body and texture, flavor and overall acceptability. The sensory evaluation results are presented in terms of average scores awarded by the judges.

### Color and Appearance

The scores of color and appearance for the treatment and control samples are presented in the Table 2. As shown from the table the scores for 25% and 50% replacement samples were 7.7 and 6.8 respectively, as against 7.9 for control. This indicates that the control and 25% replacement sample was secured almost similar scores. Kruskal Wallis one way analysis of variance was applied for statistical analysis of the data obtained, the results indicated that the replacement of SNF with SPI-WPC mixture had no significant effect on color and appearance of yoghurt.

### Body and Texture

The scores of color and appearance for the treatment and control samples are presented in the Table 2. The

experimental samples awarded mean scores of 7.4 and 7.0 for 25, and 50% replacement respectively as against 7.5 for control. The Kulfi prepared with 25% replacement of SNF is similar to control and 50% replaced sample secured least a score of 7.0. Kruskal Wallis one way analysis of variance was applied for statistical analysis of the data obtained, the results indicated that the replacement of SNF with SPI-WPC mixture had no significant effect on body and texture of yoghurt.

### Flavor

As could be seen from the table, the flavor scores were 7.5, 7.3, and 6.9 for control, 25 % and 50% replacement samples respectively. From the table it is clear that 50 % replacement sample secured at least a score of 6.9. Kruskal Wallis one way analysis of variance was applied for statistical analysis of the data obtained, the results indicated that the replacement of SNF with SPI-WPC mixture had no significant effect on the flavor of yoghurt.

### Overall Acceptability

As shown in the Table 2, the scores for overall acceptability of the sample were 7.6, 7.5 and 6.9 for control, 25 % and 50 % replacement sample respectively. From the table it is clear that the scores for control and 25 % replacement sample were almost same. Kruskal Wallis one way analysis of variance was applied for statistical analysis of the data obtained, the results indicated that the replacement of SNF with SPI-WPC mixture had no significant effect on the overall acceptability of yoghurt.

**Table 2: Effect of Substitution of SNF with SPI-WPC (1:1) Mixture on Sensory Attributes of Yoghurt\***

Extent of Replacement	Color and Appearance	Body and Texture	Flavor	Overall Acceptability
control	7.9	7.5	7.5	7.6
25 %	7.7	7.4	7.3	7.5
50 %	6.8	7.0	6.9	6.9
	NS	NS	NS	NS

\* Average of 3 Trials

NS- Non Significant

### Effect of Replacement of SNF with SPI-WPC (1:1) Mixture on Physico-Chemical Characteristics of Yoghurt

Effect of replacement of SNF with SPI-WPC mixture on acidity and pH of Yoghurt was investigated. The results indicate that the acidity increased slightly with the increase in the replacement of SNF with the SPI-WPC mixture and there was a corresponding decrease in the pH of Yoghurt. This could be attributed to the higher protein content, increased number of charges and slightly higher acidity of SPI. But statistical analysis revealed that the change in acidity and pH was not significant. This is due to the fact that both SPI and WPC did not contribute to lactic acid. Similar results were reported by Chidananda (2003) when egg yolk solids were used in preparation of yoghurt.

### CONCLUSIONS

Soy proteins, as well as whey proteins are well known for their high nutritional value and excellent functional properties in food products. Nutritional and functional characteristics of proteins are related to the structure and confirmation of these proteins. During recent decades, interest has grown in the nutritional efficacy of these proteins in infant food formula, diet and health foods. Functional properties of proteins in food are determined by their structural

changes. Protein aggregation and gelatin is often the key for their suitability to certain functionality. The good gelling properties of the soy and whey proteins imparts better functional properties and value addition to food, as a result, there is growing consumer demand for high quality proteins used in varieties of food to impart desirable theological qualities.

Soy protein isolate and Whey protein concentrate were blended in 1:1 proportion and used to replace SNF in 25 and 50% levels in yoghurt. The replacement had no significant effect on color and appearance of yoghurt. The scores obtained for experimental samples were slightly lower than that of control. This could be due to the slight brownish color of soy protein isolate.

The flavor scores were slightly decreased with increase in level of replacement may be due to release of sulfhydryl groups from WPC during heating, and may be also due to the felony flavor of SPI. But, it was not statistically significant. In case of body and texture, the average scores of control and 25 percent replacement sample were almost same. But the scores were decreased with further replacement probably due to the slight increase in hardness of the sample. Statistical analysis showed that the replacement had no significant effect on body and texture scores of yoghurt.

The overall acceptability scores of control, 25% and 50% replacement samples were 7.6, 7.5 and 6.9, respectively. This clearly indicates that 25% replacement sample is on for weight control, with enhanced nutritional quality. Statistical analysis revealed that, there is no significant effect of replacement with respect to overall acceptability.

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